Scientific Inquiry
7-1   The student will demonstrate an understanding of technological design and scientific inquiry, including the process skills, mathematical thinking, controlled investigative design and analysis, and problem solving.

7-1.5   Explain the relationships between independent and dependent variables in a controlled scientific investigation through the use of appropriate graphs, tables, and charts.
Taxonomy Level: 2.7-B   Understand Conceptual Knowledge

Previous/Future knowledge: In 4th grade, students recognized the correct placement of variables on a line graph (4-1.5) and constructed and interpreted diagrams, tables, and graphs made from recorded measurements and observations (4-1.6). In 5th grade (5-1.5), students constructed a line graph from recorded data with correct placement of independent (manipulated) and dependent (responding) variables. In 8th grade (8-1.3), students will construct explanations and conclusions from interpretations of data obtained during a controlled scientific investigation.

It is essential for students to know that the relationship between the independent (manipulated) variable and the dependent (responding) variables can be interpreted through the use of appropriate graphs, tables, and charts.
- Graphs convert data sets into an organization form that is often better understood than written narratives or columns of numbers.
  - Graphs contain a title, increments, and labeled axes.
  - The horizontal and vertical axes of the graphs identify the variables.
    - The horizontal axis identifies the independent (manipulated) variable.
    - The vertical axis identifies the dependent (responding) variable.
    - For each independent (manipulated) variable number there is a corresponding dependent (responding) variable number.
- Different graphs are used to represent different types of data.
  - Bar graphs organize descriptive data that comes from research questions asking about variables that will be counted and are often used to compare the quantities of different qualitative factors.
  - Line graphs display continuous data that comes from questions that ask about variables that investigated over time.
  - Line graphs show how quantitative data changes over time or relationships between manipulated (changing) variable and responding (resulting) variable.
- Data tables and charts allow data that include numbers and measurements to be displayed in an organized fashion.
  - A data table should be planned before the investigation starts.
  - The independent (manipulated) variable is listed in the column on the left side.
  - The dependent (responding) variable is listed in the column(s) on the right side.
  - If qualitative data is to be gathered, include enough space to write the observations.
- The relationship between the independent (manipulated) and dependent (responding) variable can be interpreted using the presented graph, table, or chart. For example,
  - On a line graph, if the slope of the line is positive, then the relationship between the variables is also positive.
  - On a bar graph, if the height of the bar is lower than the others, the quantity is less.

NOTE TO TEACHER: A mnemonic device that can be used to teach the appropriate locations of the variables on a graph is DRY MIX.
- DRY represents Dependent-Responding-Y-axis.
- MIX represents Manipulated-Independent-X-axis.

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It is not essential for students to use statistical analysis to explain the results of an investigation or the relationship between variables.

Assessment Guidelines:
The objective of this indicator is to *explain* the relationship between independent and dependent variables in a controlled scientific investigation through the use of appropriate graphs, tables, and charts; therefore, the primary focus of assessment should be to construct a cause-and-effect model of the relationship between variables. However, appropriate assessments should also require students to *identify* the correct placement of variables on graphs; *recognize* appropriate increments for a graph of recorded data; *compare* data to an appropriate graph; *exemplify* appropriate graphs from recorded data; *compare* graphs, tables, or charts with recorded data; or *interpret* the relationship between the variables as presented on a graph, table, or chart.